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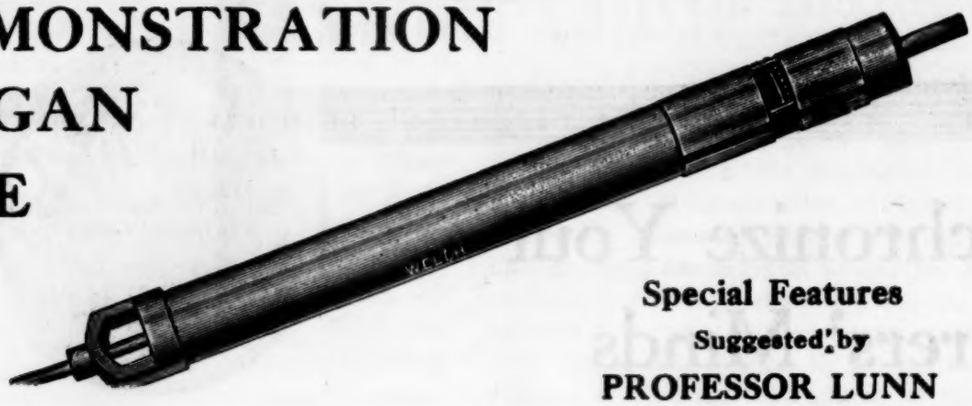

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SCIENCE

FRIDAY, MARCH 18, 1921

CONTENTS

MSS. intended for publication and books, etc., intended for review should be sent to The Editor of Science, Garrison-on-Hudson, N. Y.

MEDICINE AND THE PUBLIC[1]

Mr. President, Members of the Medical Society, Ladies and Gentlemen: We are gathered here to-night to dedicate this building to the science of medicine in the District of Columbia, and, in a broader sense, to the service of the community and humanity.

This beautiful building is the realization of the dream of the society for a century and over, and has been made possible by the loyalty and self-sacrifice of a large majority of the medical men of this city, and the generosity of many friends of our profession here and elsewhere.

The funds necessary for the erection of this building were raised in two years by the persistent, untiring efforts of the members of the building committee, who have had supervision of the preparation and execution of the plans, and who feel that they can congratulate the architect, the contractor, the Medical Society and the District of Columbia upon the results.

While the funds immediately necessary for the erection of the building have been raised, there remains a mortgage of fifty thousand dollars to be carried by the society.

It is the desire of a majority of the members that this indebtedness be paid off in the near future in order that this building may be presented to posterity as their contribution, leaving the care and maintenance as the only burden.

The aim of the Medical Society as typified in this building is the elevation of the profession to a higher scientific standard for increased public usefulness. There can be no doubt that this aim concerns the public even more than it does the profession. The more highly developed the scientific attainments of the medical profession, the more it redounds

[1] Dedicatory address delivered on occasion of the opening of the new home of the Medical Society of the District of Columbia, January 12, 1921.

to the advantage of the public, which receives thereby increasingly efficient service from the individual members of the profession. It is in this way that the interests of the profession and the laity are interwoven.

Feeling, as we do, that the influence of our profession in public affairs just at the present time is not so potent as it was a generation ago, or as it should be, we have cast about to discover the cause and, following the traditions of our profession, to apply the appropriate remedy for the malady. After oft-repeated discussions the general feeling has come to prevail that the lack of professional solidarity is the underlying cause which robs us of the influence at the council table of our city which unselfish devotion to the best interests of the public appears to justify.

Recognizing the gravity of this condition, our former president, Dr. Davidson, conceived the cure, in leading the society to undertake the erection of a commodious centrally located home of its own. To him the members of the society are indebted for this beautiful edifice and his name will go down in the history of the society, and of this city, as one of the great benefactors of his time.

The beneficial effects are already evidenced in the enthusiastic loyal cooperation of the members of the society and of its lay friends who have made possible the completion of the task, rendered more difficult by the disturbed conditions which prevailed in this city and throughout the length and breadth of the land.

No profession has loftier traditions and aims than have animated the medical profession throughout all the ages. In the past the medical profession has been interested in all the great questions of the day, whether pertaining to the health of the community or matters entirely outside of the realm of medicine.

Let us not be satisfied with the accomplishment of scientific attainments, but ever keep in mind our broader duties as citizens of this great republic.

In fulfilling our duty to the public let us not be unmindful of our sacred obligations to the fellows of our own profession, especially those who through misfortune need our aid, sympathy and encouragement. In this connection may we not do well to borrow from the little people across the Pacific the motto which is symbolized in those two little bronzes seen upon the Temple of Nikko, which warn the traveller to "see no evil, hear no evil, speak no evil." In the consideration of our broader duties as true physicians, let us lend our earnest aid not only to those in whose keeping the moral and spiritual welfare of the community rests, but to give in our daily work such council and encouragement along these lines as lie within our power.

In turning to a consideration of what the Medical Society of the District of Columbia has accomplished for our city we find achievements of which we may be justly proud. The curbing of typhoid by securing an abundant supply of pure water and pure milk; the medical inspection of the school, by which nutritional diseases, defective eyesight and infectious fevers are reduced to a minimum; providing for new hospitals, raising the standards of the older institutions; the practical elimination of malaria through the reclamation of the Potomac flats, which were the breeding places of the mosquito; the effective control of contagious and infectious fevers through compelling quarantine, with report of such cases to the Health Department; the inauguration of the crusade against tuberculosis and the bringing the knowledge of its communicability and the care of the disease to the attention of the public; the compulsory registration of births and deaths and many other questions pertaining to the welfare of the public have been enthusiastically supported by one Medical Society.

What I have said will convince you that the best individual and collective efforts of our profession as represented by the Medical Society of the District of Columbia have been and are being spent in the service of the community and of our country.

Perhaps in none of the professions does the student by his mere entry accept such a burden of responsibility; and, if achievement is measured by opportunity, in no other profession is he so certain—whatever his accom-

plishments—to fall far below the ideal set for him by the traditions and history of his calling.

From the days of St. Luke to this very evening, the profession has recognized its duty and responsibility and in the fullest sense has endeavored to meet them. As steadily and quietly as water flows, and with the same beneficent effect upon mankind, the work of the medical man has proceeded through all the ages covered by recorded history.

At first, service rendered by his own hands to the sufferer—combining the functions of physician, surgeon, nurse and pharmacist; then, with the development of knowledge, a separation of these fields of work; then a cultivation and intensification of the possibilities in each field; but always service.

Always the subordination of his own comfort; of opportunities for wealth; of leisure; of home life; of public recognition; to the need of serving mankind; and, in instances without number, the sacrifice of life itself in the effort to serve his fellow man; to extend and broaden knowledge, and thereby acquire the means whereby others might live.

No man dare think or say these things of himself; but if they are to be seen in others, if they form a part of the noble traditions of a profession to which he has been called; if they are of the very character and being of his brothers in that profession, then he may recognize and proclaim them, for they are not only his, they are a portion of the heritage of all mankind.

The members of this Society permitted no object of personal ambition and no activity of professional life to withhold from our government during its hours of stress the devotion and service due from each citizen. This was proven by the ready response to the government's call for physicians during the recent World War, when more than one fourth of the total number of our doctors enlisted in one or another of the three branches of the service. Of this number three made the supreme sacrifice in giving their lives for their country.

During the campaign for obtaining funds for the erection of this building it was interesting and gratifying to note that when the public became acquainted with the aims and accomplishments of our medical society, it responded promptly and generously to our appeal for financial assistance, and I repeat, that this appeal was not wholly, nor indeed in greater part, for the ultimate benefit of the medical society, for, as I have already shown, the interest of the community and the society are identical.

Through the influence of this building the standard of medical practise will be elevated. This will come about by additional facilities for scientific research, by lectures with their stimulating discussions, as well as by the presentation of unusual cases and rare specimens.

The Medical Society of the District of Columbia has the standing of a state society and as such is an integral part of the American Medical Association. One of the nine trustees of the American Medical Association who controls the finances and policies of that great organization composed of more than sixty thousand men of the medical profession, is a member of our society. The society also has its representative in the House of Delegates of the American Medical Association. It may not be inappropriate to mention in this connection that we are the only state society to hold weekly meetings throughout the year, which in itself increases immeasurably its sphere of teaching.

The Medical Society of the District of Columbia was founded September twenty-forth, eighteen hundred and seventeen, and during the one hundred and three years which have elapsed since that time the science of modern medicine has been developed. The society numbers among its members past and present physicians who have made valuable contributions to the development of medical science.

The membership body of the Medical Society of the District of Columbia comprises every branch of medical science and every age of medical man from the recent graduate to those who through long years of service

have earned retirement. The society especially fosters and encourages younger members to read essays and to present unusual cases, and they are always certain of an appreciative audience. This is a keen incentive to study and research work.

Since it is true that history repeats itself, is it not well to pause now and then to take a glance at the achievements of the past in order to gain new encouragement for the accomplishment of the future?

A survey of its history shows that medicine has had a far greater development in the past century than in all previous time. The changes that have taken place have been truly stupendous. The current of medical progress is still in rapid and vigorous flow, with no sign of slowing. A multitude of keen investigators are eagerly and industriously hunting out and developing new knowledge and new methods. Every year or two yields new facts of fundamental value. These discoveries are rapidly assimilated into the body of diagnostic and therapeutic methods and practise; the novelty of one year becomes the routine of the next.

Of the great body of science, medicine is an integral part. In no department of knowledge is scientific method more rigorously pursued, or with more productive results than in medicine. It is the use of the scientific method alone that has brought about the vast development of medicine within the past century, with all the resultant benefit to mankind. In no field of human activity is there a greater exercise of humanitarian spirit than in medicine. In the difficulties that confront mankind to-day, the course and the duty of the medical profession are clear—to continue the vigorous employment of those scientific principles and the exercise of the altruistic spirit that elevated medicine out of the empirical and stagnant inefficiency that characterized it for a thousand years. Furthermore, medicine is in a position to offer the application of those same principles and spirit to the solution of the grave difficulties that confront mankind to-day. Medicine can proudly present its record before the world as a conspicuous example of the attainment of substantial efficiency and social service; the methods and the spirit that have brought success to medicine ought to help in bringing equal efficiency and achievement in industrial, economic and civic institutions.

The great achievement of medicine not only affords us inspiration and pride, but impose upon us serious responsibilities and obligations. It is our duty, individually and collectively, to keep ourselves worthy of our great profession, assiduously to cultivate our art, to maintain unimpaired the great heritage of the past, and, as opportunity offers, to add to the store of medical knowledge. We should cherish the principles and the spirit that have brought us to our proud position. We should keep aglow the light that has dispelled so much of the darkness and obscurity of the peculiar problems that confront us, and let that light shine into the gloom of a disordered world. In the consciousness of the great achievements and usefulness that have been attained, and in our own assiduous efforts to live up to the spirit of our great profession, rest the greatest satisfactions and the greatest rewards that can come to us.

Will you not turn with me for a brief glance at some of the developments in medicine during the last half century. In the short time which I have at my disposal it will be possible to touch only the high lights of this subject.

Fifty years ago the use of the microscope was in the hands of a few men who devoted their lives exclusively to research work, whereas to-day, it is one of the instruments at the right hand of every busy practitioner, who would feel as much at sea without it as without his stethescope or test tube.

Among the broader developments of the last half century when medical science branched out and its progress depended upon highly specialized study and research, the practise of medicine evolved the specialist. These have increased to enormous numbers, and surely for the most part are justifiable, but it must be confessed that some are needless and immature. It will require a decade or more to

drop to the mean level in this regard. There can be little doubt but that the pendulum is swinging from the extreme degree in specialized medicine so that in a few years the normal balance between the specialist and the general practitioner will be established.

Along with the growth of specialized medicine has come the laboratory, which at the present time is the brain of practical scientific medicine. It is to the laboratory that we are chiefly indebted for all of the great discoveries in medicine and the allied sciences. The beginning of this era of laboratory work was the establishing of Von Ziemssen's laboratory in Munich in 1885.

Among the great discoveries which we owe to the laboratory are Pasteur's work on pathogenic microbes, in which he brought out the theory of protective inoculation against certain infectious diseases. Later on he gave to the medical world the results of his studies on rabies and anthrax, which have been of immeasurable service to mankind throughout the civilized world.

About the same time Koch introduced a new method for the isolation and pure culture of bacteria which is essentially the same as is now in use. In 1874 Ehrlich improved the method of staining smears which had been worked out by Weigert three or four years previously. This opened the door to the study of a great number of microorganisms and has proven one of the most important diagnostic criteria in the practise of medicine. As a result of Weigert's and Ehrlich's laboratory technique the spirillum of relapsing fever was discovered in 1873 by Obermeier and the parasitic amœba in dysenteric stools by Loesch in 1875. Koch was able to grow anthrax bacilli for the first time in artificial media in 1875. In 1879 Neisser announced the discovery of the gonococcus. In 1880 Pasteur presented his monograph on the study of the streptococcus and the staphylococcus which had been isolated for the first time by him two years previously. About the same time Eberth described the typhoid bacillus as the cause of the continued fever known as typhoid. Laveran discovered and described the plasmodium of malarial fever, November 6, 1880.

Perhaps the most important of these discoveries and the one which attracted instantly the most wide-spread attention among the laity as well as the medical profession was that of the tubercle bacillus by Koch in 1882. Tuberculosis had been known and observed for centuries, but the microorganism which produced it had eluded all of the keenest observers up to that time. Another almost equally important discovery made by Klebs in 1883 was the diphtheria bacillus; its causal relation to diphtheria was demonstrated by Loeffler in the same year. Along about this time came the discovery of the tetanus bacillus, the colon bacillus, the meningococcus, the bacillus of Malta fever and a number of others. Still another contribution along this line was that of Smith and Kilbourne, who discovered that Texas fever was transmitted by the cattle tick. However, some years antedating the announcement of Smith and Kilbourne, Dr. A. F. A. King, of this city, read a paper before this society in which he expressed the belief that malaria was transmitted by the mosquito. This may, and probably did, give a hint as to the transmission of certain infectious diseases, which led to valuable discoveries, chief of which was that of Reed and Carroll of this city, who demonstrated that yellow fever was transmitted by a certain species of mosquito; thus corroborating Dr. King's theory. As a result of this discovery Cuba was made safe to the traveler and the completion of the Panama Canal was made possible.

Another notable contribution to practical bacteriology was the discovery in 1896 by Widal of the agglutination test for typhoid fever, upon which the present-day differential diagnosis between typhoid and other continued fevers rests.

With the mention of one additional important discovery I will pass on to developments in other fields. Perhaps none of these mentioned heretofore have arrived at a more prominent place in the history of valuable discoveries than Wassermann's serodiagnosis

of syphilis in 1907 and Schaudinn's discovery of the *Treponema pallidum*, two years earlier, in 1905.

Medical science is indebted to the pathologists for many important and valuable contributions during the past fifty years. As a result of their investigations the pathology of many of the diseases to which human flesh is heir has come to be more or less understood. The progress of physiology has kept pace with pathology along allied lines, but its scope is much more comprehensive than the latter, as it invades the domain of chemistry to some extent. This field of medical research has contributed more of practical value than any other, with the exception of bacteriology, with which it is also closely linked. In this field has been developed the knowledge of the ductless glands which at the present time is attracting so much attention. It was Brown-Sequard who, in 1891, called attention to this domain of the body.

Charcot laid the foundation for the later developments in psychoanalysis by his studies on hysteria a half a century ago. Freud in the present generation has carried this branch of medicine to the point of practical application. To Golgi's method of staining, which was given to the medical profession in 1873, the knowledge of the histology of the nervous system is attributable.

The place which Lister occupies in relation to the developments of surgery is recognized by the entire scientific world. Not infrequently he is alluded to as the father of modern surgery. As he antedates the period covered by this paper I will not dwell further upon his achievements, although to him may be attributed the foundation of aseptic surgery.

The advancements in this branch of medicine are so many and spectacular as to well nigh overwhelm the chronicler of a brief history of medical progress.

One of the earliest important steps in the progress of surgery was the introduction of steam sterilization of dressings and instruments in 1886 by von Bergmann. This superseded corrosive sublimate antisepsis then in use.

Esmarch, in the early seventies, called attention to his method of controlling hemorrhage at operations by bandaging the limb above the site of operation, thereby giving the operator an almost bloodless field and greater freedom for exact work, and at the same time saving the patient from unnecessary loss of blood.

Sir Spencer Wells went a step farther and devised the clip or hemostatic forcep to pick up the individual bleeding points at the site of operation, this doing away with Esmarch's method.

Local anesthesia by ether spray was introduced by Richardson in 1886 and cocaine by Anrep and Kohler about the same time. Dr. Corning, in 1885, described the results of his experiments in spinal anesthesia, although the claim for this new and important discovery has been made in Germany on behalf of Bier in the same year. Six years later Quincke called attention to the importance of a study of cerebro-spinal fluid in certain local and system diseases.

As a result of the work of Corning, and later Quincke, Crile developed his method of anocia-association, which for a brief time was widely used.

The strides in abdominal surgery during the past twenty-five years have been so rapid, varied and extensive as to make it impossible to select any high points for mention, since they all come well within that category.

It may not be inappropriate to call attention in passing to the fact that much of the recent progress in field surgery has been due to the great surgical clinics which have been developed during the past twenty years, both here and abroad.

The care of the mother at child-birth is the oldest branch of the practise of medicine and, without doubt, the most important to the future of the world. Whereas, there have been no startling developments in this branch of medicine yet the obstetrician has kept pace with the surgeon in modern methods and asepsis.

The progress in the field of diagnosis rests

upon the developments in bacteriology, physiology, histology and chemistry. A history of any one of these necessarily describes diagnostic progress.

In therapeutics the most noteworthy advance was the gradual transition from the old-time so-called gunshot prescription to the simple single drug prescription devoted to the specific need for which it is to be used. Some of the more beneficial additions to modern therapeutics are chloral as a hypnotic and the salicylates for the relief of so-called rheumatic affections.

The discovery of the hemostatic effects of certain drugs by means of which hemorrhage beyond the reach of the hemostatic instruments may be controlled has been a great boon to the physician and to the surgeon.

In the eighties the antipyretic drugs were given to the profession and were soon eagerly appropriated by the laity for the relief of vague and distressing pains in one part of the body or another.

A very important contribution to therapeutics was the introduction of von Behring's anti-diphtheritic serum in 1893. Another was the introduction of anti-typhoid inoculation.

The modern synthetic sleep-producing drugs, of which trional and sulphonal are examples, were introduced in 1893. Novocain, which is widely used, was discovered by Einhorn in 1905. No more important remedial agent has been given to the medical profession than Ehrlich's salvarsan in 1909, which has done much to rob syphilis of its terrors both to the community and to the individual.

The multiplicity of pharmaceutical and biological products is bewildering and a large percentage of them are useless and serve merely to enrich the manufacturers and to deceive for a time the credulous public.

The most spectacular of all the discoveries in modern medicine is that of the X-ray, which Roentgen announced in 1895. Not only has it proven a useful therapeutic agent but it holds a commanding position among diagnostic methods. Another therapeutic agent which aroused a great deal of attention was the introduction of radium for the treatment of cancer and indolent ulcer, the exact value of which has not, as yet, been definitely determined. The trend of to-day in therapeutics is to limit the amount and number of drugs used, and to employ hygienic and dietetic measures in the treatment of disease, and to reach out after prophylactic methods.

In passing from a consideration of therapeutics I may be pardoned for calling attention to the fact that the medical profession differs from all others in being the only one which, in its practise, is self-destructive, by teaching the public laws of social hygiene and of preventive measures.

A necessary development in the scientific care of the sick was the advent of the trained nurse, who came to be recognized as a necessity in the latter part of the nineteenth century. Nursing as a profession was suggested by Dr. Samuel Gross about fifty years ago, and shortly thereafter, on August 1, 1875, the first training school for nurses was formally opened at Bellevue Hospital, N. Y. Soon, other training schools were established, until at the present time training schools for nurses are to be found in great numbers throughout the civilized world.

It would be difficult to conceive the possibility of carrying out the modern methods of caring for the sick without the invaluable aid of that great body of earnest and intelligent women who go to make up the nursing profession. One has only to mention the Red Cross to realize the deep root the nursing profession has taken in the social fabric of the world.

Of necessity the scheme of medical education and the development of medical libraries have grown with the needs arising out of the progress of the profession during the past half century.

Having considered briefly a few of the more important epoch-making discoveries which have marked the progress of the medical profession during the past half century, may we not draw therefrom encouragement to look at the future, rich in the promise of developments which will progressively lessen

disease, wretchedness, poverty and despair. This, ladies and gentlemen, is truly the highest mission of the medical man.

There remain many problems which in our day are yet unsolved and in each decade new questions will arise.

Among some of the more pressing problems which face the medical profession of to-day is the discovery of the cause of cancer; a more perfect control of tuberculosis, leading to its ultimate eradication; the ultimate elimination of venereal diseases through compulsory registration, and a wider dissemination of the knowledge of these diseases among the laity, a more accurate knowledge of the etiology, pathology and care of epilepsy, the sufferers from which are the most pathetic and dependent members of society; the relief of and the ultimate prevention of nutritional diseases through a more perfect knowledge of dietetics and hygiene on the part of physicians and the public; a crusade against the ever-increasing number of those, especially the young, who are afflicted with defective eyesight, due chiefly to improper lighting of homes and school rooms; and too frequent attendance at motion picture entertainments.

In closing I can not do better than to leave with you the thoughts embodied in an address by that great medical teacher, Dr. Keen, who says:

> In all humility, but with earnestness, medical men tender you their labor and practise, in the hospitals, on teacher's platform, and in the laboratory. What they expect and look forward to is appreciation, not of the individual, but of the aggregate work, and cooperation on the part of the public, for the immediate results of our work are at the same time humane and practical. The reduction in your death rate of one in a thousand means, beyond the saving of one life, a lowering of more than thirty in the total number of cases of sickness, and therewith prevention of much anxiety, wretchedness, and financial loss or ruin in as many families. Results like these are liable to be accepted as natural. It should not be forgotten, however, that they are obtained only by the work of medical men who labor for the good they can do, often as hermits, unknown, unappreciated, always bent upon the diminution of the number of problems which hitherto were deemed hopeless.

William Gerry Morgan
Washington, D. C.

THE SCIENTIFIC BASIS OF SCIENCE TEACHING

The article on "The Scientific Teaching of Science" in the issue of October 15, 1920, is both suggestive and disappointing. It is suggestive because it is the record of an experiment in the methodology of science teaching; it is disappointing because the title leads one to hope that some one has at last accumulated the necessary fact basis for the scientific teaching of science, yet the article presents no such facts.

The author says that "a student will much more rapidly develop the right mental attitude by discovering facts for himself, even though they were known before, than by memorizing a multitude of facts discovered by other people." If this statement were challenged it would be quite impossible in the present state of our knowledge for the author to substantiate his point of view with facts. Probably the statement is true but the business of science is to provide a fact basis for our knowledge and establish principles indisputably. Furthermore it must not be supposed that these two alternatives exhaust the methods of procedure. It is conceivable that a student might develop the right mental attitude more quickly by imitation, following through the steps of discovery taken by some original investigator than by blundering around in a problem of his own. Whether he will or not must be determined by careful experiment, record of results, and this not with a single student, but with many.

There can be no question but that it is a very important thing both in the university and in the earlier schools to develop in the student the power of creative thought. The author of the article records an experiment in progress for three years in the scientific department of a university in which the customary laboratory-lecture-quiz method was re-

placed by a "group method" in which each pupil followed a line of investigation for himself. The results of the three years' experiment he states in the following terms: "and as the course continued, the method seemed to them (the students) increasingly desirable and successful." It seems pertinent to enquire how this was determined. Would it not be possible to present the evidence in favor of this type of work in a more concrete way? In fact, if such an investigation is to be a real contribution to the science of science teaching, must the evidence not be presented in a more concrete way?

It is not the aim of the present article to question the value of the article mentioned. It is its ambitious title that challenges criticism. The average science teacher, even the university teacher, is not yet aware of the fact that the science of science teaching must proceed in exactly the same way that other sciences have proceeded. The science teacher must awake to his pedagogical problems, these problems must be clearly defined and we must proceed to their solution by the patient accumulation of facts, formulation of tentative hypotheses, discovery of additional facts frequently by experimental methods, and on the basis of such facts we must reason to the correct solution of the particular problem. To get at the desired facts methods must be devised for the evaluation of processes, for measurement of results and these results must be capable of accurate mathematical expression. Imagine a chemist who is investigating the problem of the economic production of some industrial product presenting his results to a scientific body with the statement that "the method seemed to them (the workmen) increasingly desirable and successful" and having back of that statement no facts which he could present, no data to convince his audience. I am not criticizing Mr. MacArthur's statement. To make even such an indefinite statement is a valuable contribution at present to the methodology of our science instruction, but it shows the pitifully small progress that has been made in the science of science teaching. Until the science teachers of the country realize that pedagogy is a science, that the problems of science teaching are clear and definite and must be solved as all science problems have been solved, we can make little progress in our science instruction.

Mr. MacArthur would make the chief aim of science instruction the development of creative thought or the ability to think scientifically, and this not only in the graduate school but in the elementary school.

> It is equally important that the beginnings of a science be taught by the scientific method as that graduate work be so carried on. For the early years in any science should be given largely to discovery and original research, as are the early years of childhood. Thinking and first-hand contact would better come early, else they may never come.

Personally I heartily endorse this statement. The discovery of the importance of the scientific method of thinking and its application to the problems of life is one of the great if not the greatest contribution of science to the life of mankind and it is the greatest contribution that science teaching can make to the life of the individual. Yet in a class of thirty-eight principals and superintendents this last summer to whom was submitted a list of aims of the elementary science of the high school with the request that they number them in order of importance, this matter of training students in the scientific method of thinking was placed nine in the list of ten. This indicates—much additional data is required to prove it—what I believe is the general impression among the executive officers of the secondary schools that training in scientific thinking is a relatively unimportant thing in science instruction. Indeed science instruction is not deemed a matter of great importance. Less than half the high schools of Illinois (48.5 per cent.) require any science for graduation. In 18.8 per cent. of them the requirement is satisfied with one half year of physiology.

Is it not high time that the science teachers of the country be organized into a national association

(*a*) to enlist in active propaganda to impress the community at large and the educational fraternity in particular with the importance of science instruction;

(*b*) to discuss and agree upon the aims of science instruction, their relative importance, and proper grade placement;

(*c*) to discuss and agree upon the principles of selection of the subject-matter for the curriculum and the placement of this subject-matter in the various levels of the school;

(*d*) to stimulate accurate scientific investigations along the above lines and also in the methods of teaching science;

(*e*) to devise tests to determine in how far we are succeeding in accomplishing the desired aims of science teaching by the methods in vogue;

(*f*) to employ a national secretary for part time at the outset and ultimately for all of his time who would extend the influence of the organization, make it efficient and coordinate the work of individual investigators along the above lines.

Elliot R. Downing
The School of Education,
University of Chicago

SCIENTIFIC EVENTS

BIOLOGICAL SURVEY OF THE STATE OF WASHINGTON

During the past year biological investigations of the distribution and habits of the birds and mammals of the state of Washington have been continued by the Bureau of Biological Survey, U. S. Department of Agriculture, in cooperation with the State College of Washington, and the State Normal School, Bellingham, Washington. Early in July, 1920, there was begun a biological cross-section of the state, which, when completed, will extend from Bellingham on Puget Sound to the Pend d'Oreille country in the extreme northeastern corner of the state. During the summer season more than 200 miles were traversed by pack train in the northern Cascade Mountains, the party consisting of Professor William T. Shaw, State College of Washington; J. M. Edson, State Normal School, Bellingham, and George G. Cantwell and Dr. Walter P. Taylor, of the Biological Survey, the last named being in general charge of the work. During the fall months Mr. Cantwell continued the cross-section, making studies in the Okanogan Highlands just south of the Canadian boundary between Oroville and Marcus, Washington. Contrasts in the fauna and flora as thus far developed are marked, and indicate that when the work is completed, materials will be available for a significant treatment of an interesting ecologic transect. It is hoped to complete the field work in the state during the present year.

THE PRESERVATION OF NATURAL CONDITIONS

The Ecological Society of America's Committee on the Preservation of Natural Conditions has been listing and describing areas with original flora and fauna, preserved and desirable for reservation for scientific purposes, and is now just entering on the more extensive field work, with three additional joint chairman added. The plan of work and men in charge are as follows: Professor V. E. Shelford, University of Illinois, Urbana, Ill. (senior chairman, research and publication) is continuing preparation of the list which is to serve as a manual on natural areas with sections on the care, management and uses. R. B. Miller, state forester, Urbana, Ill. (chairman, publicity state organization) wishes to enlist the cooperation of one organization interested in science in each state and province. Dr. F. B. Sumner, Scripps Institution, La Jolla, Calif. (chairman, organization of research interests) is working on a union of research interests in natural areas, as represented by scientific societies, museums, and universities, into an organization to provide needed funds. C. F. Korstian, U. S. Forest Service, Ogden, Utah (chairman, Natural Areas in National Forests) is working on the selection of suitable natural areas which may be set aside within the existing national forest. Those having knowledge of areas preserved suitable for preservation, es-

pecially those who have studied special areas, are requested to communicate with V. E. Shelford at once as the list is soon to be completed.

SCIENTIFIC LECTURES AT OTTAWA

MEMBERS of the Department of Mines, Canada, are giving in the auditorium of the Victoria Memorial Museum, Ottawa, lectures as follows:

March 4: "The building of the continent," by D. B. Dowling, geologist.

March 11: "The anthropological field in Canada," by Dr. Edward Sapir, anthropologist.

March 25: "Zoological work in Canada," by R. M. Anderson, zoologist.

April 8: "A recent chapter in the geological history of Canada" (illustrated with slides of the Greenland Ice Cap), by Edward M. Kindle, paleontologist.

February 12: "The fur-bearing animals of Canada," by Clyde L. Patch.

February 19: "The birds of Bonaventure Island" (with motion pictures), by Clyde L. Patch.

February 26: "The Canadian Arctic coast," by K. G. Chipman.

March 5: "Wanderings with the Eskimo," by D. Jenness.

March 12: "Roads to wealth in our northern forest, or mineral development in northern Ontario" (with motion pictures), by T. L. Tanton.

March 19: "Hunting giant dinosaurs in the Badlands of Alberta," by Charles M. Sternberg.

March 26: "Ottawa three times submerged and how we know it" (with motion pictures), by M. E. Wilson.

April 2: "Conquering the desert with irrigation" (with motion pictures), by Harlan I. Smith.

April 9: "Asbestos or fireproof cotton" (with motion pictures), by R. Harvie.

April 16: "My summer among the Ojibwa Indians," by F. W. Waugh.

April 23: "The frogs, salamanders and snakes of Ottawa," by Clyde L. Patch.

THE RESIGNATION OF PROFESSOR FLINT

YALE UNIVERSITY announces the resignation on account of poor health of Dr. Joseph Marshall Flint, professor of surgery since 1907, to take effect at the close of the present university year. Dr. Flint is planning to go to his home in California after commencement. The following resolutions have been passed by the faculty of the medical school:

The faculty of medicine have learned with deep regret of the resignation of Dr. Joseph Marshall Flint from the chair of surgery, which he has so ably and faithfully filled since 1907.

Coming to this university with a broad and thorough scientific training, and with high ideals, Dr. Flint became the original full-time professor, and has done great service both by precept and by example, in upholding high standards of teaching, research and practise.

He has always shown great tenacity of purpose and devotion to principle. Whatever success the Yale School of Medicine may have in the future will have been made possible by the loyalty and steadfastness of Dr. Flint and Dr. Blumer, whose joint service at a time of great stress succeeded in tiding over the crisis that economic conditions and new developments in medical education had brought on.

The faculty desire to place on record their high appreciation of Dr. Flint's services to the university, to the nation and to science, and to express their keen sense of loss at his leaving. They wish him full and speedy recovery of health and a large measure of success in his future work.

THE INTERNATIONAL UNION OF RADIO TELEGRAPHY

AN American Section of the International Union of Scientific Radio Telegraphy has been formed and has adopted a constitution which provides:

1. The American Section of the International Union of Scientific Radio Telegraphy shall consist of an executive committee and of the members of the technical committees provided for in paragraphs 2 and 3 below.

2. The executive committee of the American Section shall consist of the chairmen of the divisions of physical sciences and of engineering of the National Research Council (ex officio); one member each of the following: The Army, the Navy, the Department of Commerce, the Institute of Radio Engineers; four members at large to be appointed by the president of the National Academy of Sciences; and (ex officio) officers of the International Union of Scientific Radio Telegraphy resident in the United States.

3. The duties of the executive committee shall be: To act as the representatives of the United States in the International Union of Scientific Radio Telegraphy in the interim between its regular meetings; to organize the American Section, including its technical committees, and to arrange for a meeting of the American Section shortly preceding each regular meeting of the International Union; to select delegates to the meetings of the Union; and in general to deal with all scientific radio questions involving the participation of the United States. The chairman of the executive committee of the American Section shall be a member (ex officio) of the Division of Foreign Relations of the National Research Council.

The first officers of the section are:

Chairman, Louis W. Austin.

Corresponding secretary, Augustus Trowbridge, chairman, division of physical sciences, National Research Council (*ex officio*).

Technical secretary, J. H. Dellinger.

Executive committee, Louis W. Austin, U. S. Navy; Comfort A. Adams, chairman, division of engineering, National Research Council; E. F. W. Alexanderson, Radio Corporation of America; J. H. Dellinger, Bureau of Standards; Alfred H. Goldsmith, editor, *Proceedings* of the Institute of Radio Engineers; F. B. Jewett, Western Electric Company; A. E. Kennelly, Massachusetts Institute of Technology; Major-General G. O. Squier, chief signal officer, U. S. A.; Lieutenant-Commander A. Hoyt Taylor, U. S. Navy; Augustus Trowbridge.

The following have been appointed chairmen of technical committees:

Committee on Static, Dr. Austin.

Committee on Transmission, Dr. Kennelly.

Committee on Physics of the Electron Tube, Dr. Jewett.

Committee on Radio Interference (not yet appointed).

SCIENTIFIC NOTES AND NEWS

Dr. C. L. Alsberg, chief of the Bureau of Chemistry of the United States Department of Agriculture, has been appointed director of the Food Research Institute which is to be established at Stanford University by the Carnegie Corporation. He will assume his new work on July 1.

Dr. Edward Laurens Mark, for forty-four years instructor and professor of zoology and anatomy at Harvard University, will retire from active teaching at the close of this year and has been appointed Hersey professor of anatomy emeritus.

Dr. Robert F. Ruttan, head of the department of chemistry, McGill University, has been appointed to succeed Dr. Duncan G. MacCallum, as administrative chairman of the Advisory Council for Scientific and Industrial Research in Canada.

Dr. Charles W. Richardson received the honorary degree of doctor of science recently from the George Washington University.

The University of Cambridge has awarded its doctorate of laws to Sir Patrick Manson, of the London School of Tropical Medicine, and Dr. Albert Calmette, of the Paris Pasteur Institute.

Sir W. H. Bragg has been elected president of the London Physical Society. The vice-presidents who have filled the office of president are Dr. C. Chree, Professor H. L. Callendar, Professor R. B. Clifton, Sir Richard Glazebrook, Sir Oliver J. Lodge, Professor C. H. Lees, Professor A. W. Reinold, Sir Arthur Schuster, Sir J. J. Thomson and Professor C. V. Boys.

We learn from *Nature* that the twenty-fifth anniversary of the discovery of the "Zeeman effect" will take place on October 31 next. A committee has been formed by scientific men in Holland to mark the occasion by showing their appreciation of the importance of the discovery and of the distinguished services which Professor Zeeman has rendered to science. It is intended to raise a fund to be placed at his disposal for researches to be conducted in the physical laboratory of the University of Amsterdam.

Mr. George L. Harrington recently returned from South America, where he had been engaged in private work, and resumed work in the Alaskan Division of the U. S. Geological Survey. He has now returned to South America.

MR. J. W. GIDLEY, assistant curator of vertebrate paleontology at the National Museum, left Washington in January for a two months' exploratory trip in Arizona, California and Nebraska for the U. S. Geological Survey and to secure fossil mammals for the museum collection. Important finds of Pleistocene mammal remains in the vicinity of Benson, Arizona, are reported.

SIR G. SIMS WOODHEAD has retired from the editorship of the *Journal of Pathology and Bacteriology*, which he founded in 1893, and is succeeded by Drs. A. E. Boycott and H. R. Dean.

THE Brown Chapter of Sigma Xi held its initiation and banquet on March 4. Two members of the faculty, four graduate students and seventeen members of the senior class were elected members. The speaker at the banquet was Dr. Oscar Riddle, of the Cold Spring Biological Laboratory of the Carnegie Institution.

DR. ARTHUR F. COCA, of the medical school of Cornell University, editor of the *Journal of Immunology*, gave an address on Hypersensitiveness before a recent meeting of the University of Kansas chapter of Sigma Xi. Dr. Coca had been studying, for a few weeks previous, the hypersensitiveness of Indian students of Haskell Institute of Lawrence.

SIR NORMAN MOORE, president of the Royal College of Physicians, has appointed Dr. Herbert Spencer to deliver the Harveian oration in October and Dr. Michael Grabham, of Madeira, to deliver the Bradshaw lecture in November. Dr. Major Greenwood will deliver the Milroy lectures in 1922.

SHERBURNE WESLEY BURNHAM, professor of practical astronomy at the University of Chicago from 1902 to his retirement in 1914 and astronomer at the Yerkes Observatory, died on March 11, in his eighty-third year.

PROFESSOR CHARLES H. FERNALD, from 1886 to 1910 professor of zoology and entomology at the Massachusetts Agricultural College, and for several years director of the graduate school, died on February 22, aged eighty-three years.

DR. WILLIAM FISKE WHITNEY, John Barnard Swett Jackson curator of the Warren Anatomical Museum of Harvard University, died at his home in Boston on March 4, in the seventy-first year of his age.

DR. JOSEPH RANSOHOFF, professor of surgery at the University of Cincinnati, died on March 10.

WILHELM VON WALDEYER, professor of anatomy at the University of Berlin, has died at the age of eighty-five years.

THE deaths are announced of William Odling, lately professor of chemistry at Oxford University, and of Robert Bellamy Clifton, lately professor of experimental philosophy. Dr. Odling was ninety-one years of age, and Dr. Clifton eighty-five years of age.

AT a meeting of the council of the American Mathematical Society held on February 26, 1921, it was voted to accept the invitation of the American Association for the Advancement of Science to become one of the scientific societies affiliated with the association. According to the arrangements for the affiliation of scientific societies with the American Association all members of the newly affiliated society, who are not already members of the association, have the privilege of becoming members of the association without the payment of the usual entrance fee.

THE United States Civil Service Commission announces an examination for the position of superintendent and director of biological stations in the service of the United States Bureau of Fisheries. Applicants will be rated chiefly upon education and experience. Two vacancies for the above named position now exist in the Bureau of Fisheries, one at Beaufort, N. C., carrying a salary of $1,500 per annum, and one at Key West, Florida, with a salary of $1,800. In each case the additional increase granted by Congress of $20 per month is allowed, and living quarters, unfurnished, are available, free of cost to the appointee. There are opportunities for promotions to

positions with basic salaries of $2,000 to $2,500 a year, as vacancies occur. Applications must be filed with the Civil Service Commission, Washington, D. C., prior to the hour of closing business on April 12, 1921. Prospective candidates should apply to the Civil Service Commission, Washington, D. C., for a copy of form 1312, stating the title of the examination desired.

The late Professor Emil Fischer bequeathed 750,000 marks to the Prussian Academy of Sciences, the income of which is to be used to aid young German chemists doing research work in organic, inorganic or physical chemistry.

The *Journal* of the American Medical Association reports that the *Deutsche medizinische Wochenschrift* records that Dr. Lange, of Chicago, has sent to Professor Paltauf, of Vienna, 7,000,000 crowns collected in America. Also that another sum of $10,000 has been forwarded from America to aid the university professors. It was sent to Professor Pirquet for distribution. The Rockefeller Foundation has also appropriated $60,000 for assistance to the Vienna clinics. This sum is said to be equivalent to 40,000,000 crowns at the present rate of exchange. The salaries of the regular university professors at Vienna were increased materially last year, being 45,000 crowns, increasing by 4,000 crowns every fourth year to a maximum of 70,000. The *Münchener medizinische Wochenschrift* likewise reports that Dr. A. Stein, chief of the Lenox Hill (formerly the German) hospital, has recently sent a large sum collected in America to Frankfort-on-the-Main to be applied for scientific purposes.

We learn from the *British Medical Journal* that the London School of Tropical Medicine has arranged to send an expedition to British Guiana to investigate filariasis with the view of obtaining information as to its prevention and treatment. The expedition is being sent at the request, made shortly before he left the Colonial Office, of Lord Milner, who considered that the government required further advice as to the best method of controlling the disease. At the suggestion of Sir Patrick Manson the expedition will visit also certain West Indian islands, choosing one, such as Barbados, where the rate of attack is high, and another, such as Grenada, where it is low. It is hoped that by comparing and contrasting the circumstances of two such islands light may be thrown on the conditions which favor filaria. The leader of the expedition is Professor R. T. Leiper, director of the helminthology department of the London School of Tropical Medicine; the other members are Dr. G. M. Vevers, demonstrator of helminthology in the school; Dr. John Anderson, Dr. Chung Un Lee, and Dr. Mahommed Khalil of the Egyptian Medical Service. The expedition will sail this month.

Sir Ernest Shackleton is planning a new Polar expedition to the Arctic. He expects to be away for two years. According to the London *Times* he proposes to leave England in May or June next, and will take with him a dozen men, chiefly those who accompanied him on former expeditions. The Norwegian whaling boat *Foca I.*, bought in Christiania for this new expedition, is now lying at Tromsö, and will be delivered in England next month. In all probability *Foca I.* will go, in the first instance, to Hudson's Bay, where 150 dogs will be taken on board. Thence the expedition will proceed *via* Baffin's Bay—which will be reached, it is hoped, by the end of July, provided ice conditions are favorable—through Lancaster Sound, to Axel Heiberg's Land. Thence Sir E. Shackleton intends to explore the islands eastward to Perry Island, this being the main object of the expedition. These islands have been already visited by Otto Sverdrup, Godfred Hansen, and others, but Shackleton believes that there is still much scientific work to be done in that region. He will procure his equipment in England, and hopes to receive a quantity of the material which the English used in Archangel during the war. He was, it may be remembered, employed by the British government to see that the troops in North Russia were properly equipped for Arctic conditions. *Foca I.* is said, by experts, to be one of the

best boats in the Norwegian Whaling Fleet. It has a large and spacious deck, so that there will be plenty of room for dogs and sledges. Sir E. Shackleton has told an acquaintance in Christiania that he has given up the idea of exploring the South Polar regions, and in future will devote himself to the Artic.

THE *Journal of Industrial Chemistry* reports that the International Chemical Conference last June decided to hold the next conference in Poland, at the invitation of Mr. Kowalski. At that time the situation in that country seemed fairly settled, but since then affairs have become disturbed, and the council of the union has decided that the next meeting can not be held in Warsaw. Dr. Parsons has extended an invitation from the American Chemical Society to hold the 1921 meeting in the United States, but European chemists are not in a position to make this move. Therefore the council has decided to hold the next meeting at Brussels, at the end of June. However, Mr. Paul Kestner, president of the Société de Chimie Industrielle, will attend the Canadian meeting of the British Chemical Society as the French delegate, and will return by way of the United States, where he will attend the meetings of the American chemical societies.

AT the annual general meeting of the Association of Economic Biologists, as we learn from *Nature*, the following were elected officers and councillors for the year 1921: *President:* Sir David Prain. *Hon. Treasurer:* Dr. A. D. Imms, *Hon. Secretary* (*Gen. and Bot.*) Wm. B. Brierley. *Hon. Secretary:* (*Zool.*): Dr. S. A. Neave. *Hon. Editor* (*Bot.*): Wm. B. Brierley. *Hon. Editor* (*Zool.*): D. Ward Cutler. *Council:* Dr. W. Lawrence Balls, Professor V. H. Blackman, F. T. Brooks, A. B. Bruce, Dr. E. J. Butler, F. J. Chittenden, A. D. Cotton, J. C. F. Fryer, Professor J. B. Farmer, E. E. Green, Dr. G. A. K. Marshall and Dr. E. J. Russell. In view of the very great increase in the publishing costs of the *Annals of Applied Biology*, it was decided to establish a "Publication Fund," to which all interested in the progress of biology and in its application to the welfare of man are invited to subscribe. Sir David Prain then delivered his presidential address on "Some Relationships of Economic Biology."

UNIVERSITY AND EDUCATIONAL NEWS

AT the Founders' Day Celebration of the Johns Hopkins University, announcement was made that the trustees of the university would supplement the fund of $215,000 raised by the Alumni Association for a memorial dormitory building at Homewood, so that the total cost of the building might be provided for.

IN response to the recent appeal of the University of Edinburgh for £500,000, the sum of £200,000 has now been subscribed.

GENERAL LEONARD WOOD has conferred with the trustees of the University of Pennsylvania in regard to accepting the provostship of the university, vacant by the retirement of Dr. Edgar F. Smith.

PROFESSOR FRANK AYDELOTTE, professor of English in the Massachusetts Institute of Technology, has been elected president of Swarthmore College, to succeed Dr. Joseph Swain.

DR. GUY POTTER BENTON, formerly president of the University of Vermont, has been appointed president of the University of the Philippines, with a salary and perquisites of 33,000 pesos (normally $16,500). The place has been vacant two years.

DR. YANDELL HENDERSON, hitherto professor of physiology in the Yale Medical School, has been transferred to the Graduate School of Yale University under the title of professor of applied physiology.

DISCUSSION AND CORRESPONDENCE

SECTION L OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

HAVING been secretary of Section A during a number of years when this section covered both of the subjects mathematics and astron-

omy the writer fails to see much force in the objections raised in the February 18 number of Science to the name "Historical and Philological Sciences" for Section L of the American Association for the Advancement of Science. From the fact that the special committee appointed by the President of the Association recommended that the words "and philological" be dropped it appears that the rest of this name would have been satisfactory to the committee. If this is the case the main objection to the suggested name seems to be due to a fear that the philologists might at some future time "step in and give rise to a heterogeneous, incoherent group of workers, having no interests in common."

It is not much more than a century ago that the philologists opened for mathematical historians rich fields by the discovery of a key to the cuneiform inscriptions of the ancient Babylonians and the discovery of a key to the writings of the ancient Egyptians. The history of the ancient scientific developments is fundamentally connected with the languages of the people of antiquity and hence there seems to be little reason to object to a closer contact between the philologists and the historians of science, especially during the early stages of the development of the history of science in our country. As an instance of the fruitfulness of this contact it may be noted that L. J. Richardson, professor of Latin in the University of California, contributed an interesting article on "Digital reckoning among the ancients" to the first volume of the *American Mathematical Monthly* after it became the official organ of the Mathematical Association of America in 1916.

During the Chicago meeting of the American Association for the Advancement of Science a good beginning was made towards the encouragement of workers in the history of science in our country. It would seem that only the most serious considerations should be allowed to interfere with the continuance of this encouragement under the influence of a strong national organization. In particular, differences of opinion as to the most suitable temporary name of the section which aims to unite the workers in the history of science in our land should not be allowed to curtail seriously the efforts of those who believe in such a union. If the modern mathematicians and the modern astronomers could work harmoniously for so many years it seems clear that the historians of science have nothing to fear from the presence of the philologists, especially in so far as these two types of scientists are seeking common ground.

G. A. Miller

University of Illinois

Fossils—Are They Merely "Prehistoric," or Must They Also Be "Geologic"?

I am perfectly willing in my proposed definition of "fossils" to accept a substitute for the term "age," as suggested by Professor Field in his contribution to Science for February 4, if only authorities can agree on what it shall be. Of the various terms used for geological and archeological time divisions—*era, period, epoch, age*—each have been used as designations for the time since the Pleistocene. LeConte refers to this time indifferently as "Psychozoic era," "age of man," and "recent epoch." Schuchert practically agrees with these designations, Chamberlin and Salisbury call it the "human period," Professor Field in the contribution above referred to, speaks of it in one place as the "Psychozoic era," and in another as "the recent geological epoch." For other coordinate or subordinate divisions we read in various works such expressions as "Quaternary period" and "Quaternary epoch" (Brigham), "Neolithic period," "Gunz glacial stage" (Osborn), "Sixth glacial period" (Geikie), "Reindeer period" (Lartet), "Prehistoric period" (Lubbock).

We see in the above variations in usage the usual fate of recommendations of scientific congresses when they attempt to reform and draft into the exacting service of science words that have long led a life of freedom as a part of our common vernacular.

"Prehistoric," however, is not a term of this character. From the time (1851) when it was

first coined by Sir David Wilson in his "Prehistoric Annals of Scotland" to express the "whole period" (age or epoch) "disclosed to us by archeological evidence as distinguished from that known by written records," down to the present it has retained in scientific literature its original meaning. It distinctly refers to a portion of the human period (epoch or age). I fail to find Dr. Schuchert anywhere using it in any different sense. He certainly nowhere "begins the Psychozoic era" with the "historic period" as claimed by Professor Field. In spite of the latter's protest, therefore, I fail to see wherein I have misstated his position. For in between his "mastodon" (mammoth ?) "preserved in the arctic ice," which is admitted to be a fossil and his "leaf buried in the gutter," which is not, there is a vast deal of time, from younger to older—*historic, prehistoric* and *geologic*—from only the last of which—the glacial or interglacial portion—would traces of organisms be considered fossil. Neolithic man is not fossil; some of the remains of Paleolithic man are fossil. Both are prehistoric.

Recurring to the propriety or the practise of using the term "fossil" in other than its strict scientific sense, the question presents itself: how about the use of other geological terms in analogous senses? In an article in the last *Geographical Review* entitled "Race Culture and Language," the author, Griffith Taylor, is found applying the terms "inlier" and "outlier" (giving credit to geology for the idea) to certain races in Europe. The former is applied to the Basques, because they constitute an island of ancient people surrounded by younger races, and the latter is applied to the Finns because they are a body separated from the main ethnic group to which they belong, and with which they were once continuous. Most of us, I think, will be disposed to congratulate Professor Taylor on the felicity of these expressions, regardless of how much Professor Field may shake his head over the liberty taken with geological terminology.

ARTHUR M. MILLER
UNIVERSITY OF KENTUCKY

THRICE TOLD TALES

TO THE EDITOR OF SCIENCE: Referring to the letters of Professor Wood[1] and Professor T. C. Mendenhall[2] (*semper juvenis*), I too have a story about the Lick Observatory; and following their lead, hasten to make it public; and then will patiently wait for the various transmutations. Perhaps some one will prove a similar occurrence in the days of Archimedes!

Going up to the observatory in the stage with its load of Saturday night tourists, suddenly one of them asked aloud—"Who was this Mr. Lick, any how? Did he invent the telescope?"

Shades of Galileo! It *is* time to come forth and be filmed as Professor Mendenhall suggests. In the cast we could have a tourist, same species as Professor Mendenhall's "damned fraud" person. He will be shown asking—"Who is this Mr. Galileo anyhow? Did he build this leaning tower?"

ALEXANDER MCADIE
BLUE HILL OBSERVATORY,
February 16

AMERICAN PUBLICATIONS AND INTERNATIONAL EXCHANGE

IN a note just received from Professor Charles Julin, of Liége, he mentions the present unequal international exchange and how difficult it is, in consequence, for the Belgian universities to obtain foreign publications. He says that separata from our American workers will be most welcome, and asks that this suggestion be brought to our students. I think the fact is quite generally appreciated, but it can do only good to bring it again to our attention.

MAYNARD M. METCALF

SCIENTIFIC BOOKS

History and Bibliography of Anatomic Illustration. By LUDWIG CHOULANT. Translated and Edited by MORTIMER FRANK. The University of Chicago Press, 1920.

[1] SCIENCE, January 14, 1921.
[2] SCIENCE, February 11, 1921.

The purpose of this book is a presentation of the history and bibliography of representations of human anatomy by graphic means. Due consideration has been given both to anatomic illustration and to representations belonging to the graphic and plastic arts.

While engaged in the preparation of the list of the anatomists of the world[1] one of the most useful works of reference was found to be J. Ludwig Choulant's "Geschichte und Bibliographie der anatomischen Abbildung," which had been published in 1852 in Leipzig by this energetic physician. It was likewise of great value in studying the sources of anatomical literature[2] and in other ways has proven its value as an aid in the study of the history of anatomy. Its importance in the history of medicine is indicated by the nine references to Choulant's work in Garrison's "History of Medicine."

Unfortunately this important work has long been out of print and there are few copies available for the younger generation of students. It was thus with great interest that we welcomed the announcement from the University of Chicago Press of the forthcoming translation of this important historical document by Mortimer Frank, a Chicago physician who had already earned fame by his contributions to medical history. As an associate editor of the *Annals of Medical History* he made his influence felt in the development of this important journal. His great collection of early medical works and engravings, since his lamented death deposited in the library of the University of Chicago, gave him a grasp of his subject such as few men are given to attain.

Dr. Frank did not live to see his book off the press and his untimely death was greatly mourned by the profession at large but especially was his loss keenly felt by those whose interests were similar to his own. His friend, Fielding H. Garrison, acted as editor and saw the book through the press.

The book is a handsome volume and the press-work is well up to the standard of the other publication from this press. Garrison's memorial notice of Mortimer Frank introduces the book to the reader. This is followed by Frank's biographical sketch of Choulant, thus making available for the first time in English, the life of this important worker. The succeeding pages are occupied with the translation of the history and the reproduction of the bibliography to which important additions are made, thus revising and bringing the work up to date.

The illustrations of the original publication are well reproduced in the translation and add great value to the work in the hands of students of art. An unfortunate feature is the arrangement of the descriptions of the figures, these being placed in the back of the book with no references to them on the plates. In this arrangement Dr. Frank simply followed Choulant's plan in the German edition.

Choulant's original discussions of the various artists who forwarded the study of anatomy by their illustrative work may seem to the art student somewhat unequal and this same inequality is apparent in the translation; but in making such a criticism one must keep in mind that Choulant's idea was the discussion of the work of each man as he had aided in the development of anatomical illustration. His very brief account of Michaelangelo's work is not in any disparagement of this eminent Italian's work but is due to the fact that the great sculptor left few contributions to anatomical illustration.

The history and bibliography already has its place in the literature and Dr. Frank's translation will make the work available to all students of the subject. While we regret that our fellow worker was not given the joy of seeing the book off the press, yet we may rejoice that he was enabled to leave the work so nearly complete as to warrant the publication of this important contribution.

Roy L. Moodie

College of Medicine,
University of Illinois

[1] Published in Eycleshymer's "Anatomical Names," New York, 1917, pp. 177–354.

[2] This subject was discussed by the writer in *American Naturalist*, LI., 193–208, April, 1917.

SPECIAL ARTICLES

AMŒBOID MOVEMENT, TISSUE FORMATION AND CONSISTENCY OF PROTOPLASM[1]

1. IN 1901 we found through testing by direct means the consistency of the protoplasm that in the blood cells of *Limulus* amœboid movement depends primarily upon alternating changes in the consistency of the protoplasm, a phase of liquefaction being followed by a phase of hardening. There may be added to these changes in consistency changes in surface tension.[1] Subsequently we showed in experiments in which we likewise tested the consistency of the cells directly that the consistency varies under different conditions, that these variations correspond not only to the pseudopodial activity, but also to the agglutinability of the blood cells and to the formation of tissue like structures from previously isolated cells,[2, 3] that these changes due to stimulation explained the stereotropism of tissue cells,[2, 4] that they played a part in the processes of inflammation,[1, 2] phagocytosis,[4] and thrombosis.[5, 6, 7, 8] More recent observations in 1919 showed that it is possible to vary greatly the character of the amœboid movements and that the changes in the amœboid movements correspond to the changes in the consistency of the protoplasm; these observations suggested that the taking up of fluid from the surrounding fluid on the part of the cells is an important factor in these processes.[9] We furthermore showed that certain phenomena of wound healing can be imitated in this experimental amœbocyte-tissue and that the formation of giant cells which takes place in sensitive cells in contact with a foreign body represents an application of the same principle.[9] Here we have to assume that the process of liquefaction may proceed so far that two cells may flow together. We also pointed out that variations in the hydrogen ion content of the cells under the influence of stimulation might explain these changes.

2. A continuation of these experiments in Woods Hole last summer showed that in the blood cells of *Limulus* it is possible to produce graded variations in the character of the pseudopods and amœboid movements through graded changes in the osmotic pressure in the surrounding medium. Again we find correspondence between the consistency of the protoplasm and the character of the pseudopods and amœboid movement. A particularly great fluidity of the protoplasm could be produced through the use of a slightly hypotonic solution of KCl. In this case the change in consistency became so marked that it affected not only the ectoplasmic layer of the cell, but extended to the whole of the granuloplasm. There is reason to assume that these changes are associated with the taking up of fluid from the surrounding medium. Under those conditions a very peculiar phenomenon which we described previously, a circus movement of the whole cell exoplasm as well as of the granuloplasm, can be produced regularly. These movements, however, take place only if the temperature of the surrounding fluid is sufficiently high. It does not occur in cells kept at a temperature of 10°.

3. Exposure of the blood cells to a temperature of approximately 40°–42° for a short period of time produces in the periphery of

[1] From the Department of Comparative Pathology, Washington University, and from the Marine Biological Laboratory, Woods Holl.

[1] Leo Loeb, *Jour. Med. Research*, 1902, VII., 145.

[3] Leo Loeb, *Biological Bulletin*, 1903, IV., 301.

[2] Leo Loeb, *Virchow's Archiv.*, 1903, CLXXIII., 35.

[4] Leo Loeb, *Anatomical Record*, 1912, VI.

[5] Leo Loeb, *Virchow's Archiv*, 1905, CLXXXV., 160.

[6] Leo Loeb, *Hofmeister's Beitraege z. Chem. Physiol. u. Pathol.*, 1904, V., 191.

[7] Leo Loeb, *Pflueger's Archiv*, 1910, CXXXI., 465.

[8] Leo Loeb, *Biochem. Zeitschrift*, 1910, XXIV, 478.

[9] Leo Loeb, "The movements of the Amœbocytes and the experimental production of amœbocyte (cellfibrin) tissue," Washington University Studies, Scientific Series, 1920, Volume VIII., 3. (Here a general discussion of the subject is given.)

the blood cells the appearance of multiple drops into which the granuloplasm moves subsequently as it does into typical pseudopods. Transition can be observed between these drops and the typical pseudopods.

It is also possible to produce experimentally in the amœbocytes structures which very closely resemble ova in which maturation membranes have formed. Jacques Loeb has formerly shown that this formation depends upon a proces of cytolysis. In the blood cells these structures appear under conditions in which the cell has taken up fluid from the surrounding medium and the consistency of the protoplasm resembles that of a liquid. All kinds of transition between these structures, drop pseudopods and the typical tongue-like pseudopods can be found. These and other observations very strongly suggest that the formation of pseudopodia, the appearance of drops at the surface of the cells and the formation of fertilization membranes are related phenomena and that the latter two conditions represent extremes in a process which, when acting in medium intensity, leads to the formation of the typical pseudopodia.

4. Through changes in the consistency of the protoplasm in the blood cells of *Limulus* it is possible to imitate the structures corresponding to different tissues. Especially did we obtain in certain cases through an increase in the consistency of the cells tissues which resembled those composed of ganglia and glia cells. It may thus be possible to obtain indications as to some of the conditions which induce the cells of different tissues to assume different forms.

Leo Loeb

Washington University

THE RELATIVE NUMBERS OF TWINS AND TRIPLETS[1]

It may be of interest to call attention to a simple relation between the number of human twin and triplet births. The relation was noticed a number of years ago and I supposed it had been recorded, but a search has failed to reveal any published statement.

If $1/n$ is the proportion of twin births to all births in a large population during any period, then the proportion of triplet births during the same period is very near to $1/n^2$. The agreement of the data is often startling. Thus in 13,360,557 births in Prussia during the years 1826–1849 as recorded by Veit[2] the number of twin births is one in 89.1 and the number of triplet births one in $(88.9)^2$. In 1,339,975 births in the United States registration area in 1917[3] the number of twin births is one in 93.1 and the number of triplet births one in $(93.0)^2$.

From the statistical relations it would appear that triplets are produced by the coincidence of two independent processes occurring with equal frequencies. One of these processes by itself gives rise to twins. This relation would apply to any mode of origin of multiple births or to different combinations of them provided that each followed the rule.

The principle might be applied to the two chief explanations of multiple births as follows:

1. *Multiple Ovulation.*—Normally a single ovum is discharged from the ovaries. There is some coordinating mechanism which prevents the ripening of other ova at the same time. Suppose that as a result of a purely intrinsic factor, once in n times an ovum appears which fails to respond to this mechanism. The chance that two such extra ova will appear at the same time is once in n squared. Obviously this presupposes that the failure to respond is due to independent processes in the two ova. To put the case more concretely, suppose that the approach to maturation of an ovum is accompanied by an internal secretion which acts upon other ova and keeps them from completing the process at the same time. The overwhelming major-

[1] Contribution from the Zoological Laboratory of the University of Illinois, No. 172.

[2] Veit, G., 1855, *Monatsschrift für Geburtskunde und Frauenkrankheiten*, 6: 127.

[3] Birth statistics for the birth registration area of the United States, 1917, U. S. Bureau of the Census, Washington, 1919.

ity of the ova would be properly inhibited but occasionally an ovum would fail to respond because of some peculiarity in its organization. Suppose that such peculiarities are due to local factors appearing with a frequency of $1/n$. Then the chance that two such independent local factors will act at the same time and thereby cause the simultaneous discharge of two supernumerary ova is $1/n^2$.

2. *Monozygotic Twins and Triplets.*—Normally a single embryonic area appears in the blastodermic vesicle and through some coordinating mechanism inhibits the formation of additional embryonic areas. Suppose that once in n cases a cell or group of cells acquires physiological independence as the result of an intrinsic factor and forms a second embryonic area. The chance that two such cells or groups of cells will arise at the same time is once in n squared if it is supposed as in the previous case that the two events are independent of each other.

In order that the stated numerical relations may ensue, the important consideration in either mode of origin of multiple births is the independence of the two events which give rise to triplets. If, in the fluctuations of the general physiological state of the mother, the condition is sometimes such as to result in twins and sometimes in triplets, it is hard to see why the "square" relation should exist. For instance if it is postulated that additional ova are stimulated to complete the maturation process as a result of an unusual amount of an internal secretion and that the number of extra ova depends on the quantity of the secretion there is no reason for expecting the observed relation between one extra and two extra embryos. This difficulty seems to apply to all general agents that may be postulated as acting upon the ovaries as a whole in the cases of multiple ovulation or upon the developing embryo as a whole in the case of monozygotic twins and triplets. If, however, each supernumerary ovum is due to an independent local action and such local actions have a certain average frequency the coincidence of two such actions would give the observed numerical relation of triplets to twins.

If the explanation as stated applies to the relation between triplet and twin births it is to be expected that it will apply to quadruplets as well. In that case the expected number of quadruplets is one in n^3. Unfortunately the numbers are too small for a reliable conclusion. In the largest available collection of data, the one mentioned above, there are 36 quadruplets in 13,360,557 births or one in $(71.9)^3$ which is somewhat greater than the expected number, one in $(89.1)^3$.

As in other statistical relations the biological significance in the present instance can not be proved directly from the mass of data. When one considers the vicissitudes of fertilization, the chances of death of individual embryos, the demonstrated influence of the spermatozoon in certain cases of twinning and numerous other biological factors, to say nothing of faulty registration statistics, it is hard to believe that the simple numerical relation of triplets to twins can be more than the result of the combination of numerous and as yet unanalyzed forces. A knowledge of the fact may, however, aid in the analysis.

CHARLES ZELENY
UNIVERSITY OF ILLINOIS

THE AMERICAN CHEMICAL SOCIETY

SECTION OF SUGAR CHEMISTRY

C. A. Browne, *chairman*
Fred. J. Bates, *secretary*

(*Concluded*)

The sugar industry of Peru: CHAS. A. GAMBLE.

Electric oven for rapid moisture tests: G. L. SPENCER. This oven (patented August 3, 1920) is a convenient arrangement for passing a rapid current of heated air through a sample. The air is drawn over a heating element, composed of a spiraled nichrome wire coiled around a suitable core, and thence through the sample contained in a capsule, fitted with a gauze or metal filter-cloth bottom. The temperature of the air is controlled by a rheostat. Any substance through which a current of hot air may be passed, without melting, may be dried in this oven. Raw sugar may be approximately dried in 3 minutes and to constant weight in 10 minutes; 100 gram samples of cane bagasse are dried in less than 60 minutes; cotton saturated with water is dried in 10 minutes.

Refining raw sugars without boneblack: C. E. Coates. Raw sugars from the tropics have been refined off and on in Louisiana for a number of years. This was profitable on occasions when the margin between raws and granulated was high. During the past two years this margin has been so high as to offer exceptional profits to the refiner. A number of Louisiana sugar houses purchased raw sugars during the last six months and refined them by several different methods: Phosphoric acid and lime; sulphur-dioxide and lime; filtercel alone; activated wood charcoals. At the beginning of the campaign, the yields were several per cent. below those obtained in the standard bone black refinery process, but as the season went on this difference was diminished until at the present time the yield is about one per cent. short of good refinery practise. The yields by the various methods are nearly the same. There is no reason why melting tropical raw sugars can not become a part of the routine practise in both cane and beet sugar houses. The quality of the sugars obtained is excellent and in the case of the activated charcoals the sugars were beyond any criticism of any sort.

Recent advances in defecation: W. D. Horne. The Dorr Clarifier has been devised to remove the insoluble impurities from cane juice. Hot limed juice continuously enters the central well of the superimposed settling compartment equipped with slowly revolving scraper mechanisms. Clear juice flows from the periphery, and a thick mud is constantly withdrawn from the bottom. The Williamson Clarifier aerates a warm defecated raw sugar solution and then passes it through a long shallow heating tank provided with suitable baffles, causing all insoluble matters to rise in a scum, which is mechanically skimmed off, while clear liquor is continuously syphoned out below.

Comparative analysis of refined sugars: Frederick Bates and associates at the Bureau of Standards. A résumé was given of the results of an elaborate and exhaustive study of about 250 samples of refined sugars produced in the United States. One of the principal objects of this work was to determine the feasibility of preparing accurate specifications and definitions of the refined sugars. The work included the determination of the direct polarization, invert sugar, moisture and ash. The acidity and alkalinity were determined by developing a new method, using the hydrogen ion concentration with gratifying results. The average acidity and alkalinity was found to be small and indications are that the departure from neutral is a powerful factor in determining the properties of the sugar. In addition, the sugars were screened to determine average size of grain. A preliminary report was given on the importance of improving and applying the so-called candy test to refined sugars.

A graphic method for estimating reducing sugars in presence of sucrose: C. A. Browne. The slight reducing action of sucrose upon Fehling's copper solution introduces a considerable error in determining reducing sugars in presence of large amounts of sucrose. The author proposes a general graphic method which consists of a chart containing the reduction curves for dextrose in amounts from 0 to 250 mgs. in presence of sucrose from 0 to 5gs. The correct amount of dextrose, corresponding to the amount found, is determined by finding the curve which passes through the intersection of the coordinates for grams sucrose present (as determined by Clerget) and mgs. dextrose found. The starting point of this curve on the base line indicates the correct amount of dextrose.

Commercial production of d-Mannite: W. B. Newkirk and C. F. Snyder. At the request of the Army, the manufacture on a commercial scale of d-Mannite from manna was undertaken. The crude manna was dissolved in water in a melter heated by steam coils. The liquor was 17° Brix. It was heated to boiling and defecated. Three methods of defecation were employed. *Method 1:* .005 per cent. phosphoric acid added to hot liquor and let stand for thirty minutes, neutralized with lime, allowed to settle and the clear liquid decanted and filtered. The filtered liquor was boiled in open pan to 30° Brix (hot), placed in tank and crystallized. The crystals were separated in a large centrifugal. *Method II.:* The raw liquor was treated with 0.10 per cent. Kieselghur and filtered and the filtrate concentrated as above. *Method III.:* The raw liquor was treated with 0.5 per cent. commercial vegetable carbon and filtered and the filtrate concentrated as above. Method I. was the most satisfactory. The mother liquors from the first crystallization were concentrated to 40° Brix and allowed to crystallize; the mother liquors from the second crystallization were concentrated at 60° Brix and a third crop of crystals obtained. The mother liquor from the third crystallization was concentrated at 80° Brix and a fourth crop of crystals obtained. The final mother liquors were concentrated to 80° Brix and a fifth crop of crystals obtained. A tabulation is given of the

melting points and rotations reported in the literature. The specific rotation was determined in water solution for the yellow-green mercury line and we find

$$[\alpha]_E^{20} = -0.255.$$

Preservation of bagasse in sugar cane mill control: GUILFORD L. SPENCER. Formaldehyde has been generally used in preserving sub-samples of cane bagasse in preparing a composite sample, representative of several hours grinding. This has been ascertained to be only moderately efficient under modern milling conditions. The late M. Henri Pellet, in Egypt, suggested and used ammonia in protecting the samples. The author found this usually efficient but occasionally there is loss of sugar. This suggested the addition of chloroform and preservation of the bagasse in an atmosphere of ammonia and chloroform. This mixture is apparently very efficient. Refinery press-cake holds its polarization during several weeks in the presence of this preservative. The solution for polarization must be acidulated with acetic acid before clarification with lead subacetate.

Glass vacuum pan for laboratory use: M. J. PROFFITT.

Changes in the polarizing constants of sugars during refining: A. F. BLAKE. The Clerget sucrose value for sugars, as pointed out by Browne at the Cleveland meeting, normally exceeds the polarization by about one third the percentage of invert. This is true of raw sugars as shown by numerous analyses, but in the products of a refinery, soft sugars and syrup, the value of the ratio (S–P)/I is very low. Analyses of sugars at all intermediary stages of refining are given, in order to determine where the change takes place. It is concluded that some change takes place during defecation and filtration of low test material and in the handling of the muds and scums due to action of lime on the invert sugar, but that by all means the principal cause of the reduction of the value of this ratio is bone-black filtration. The factor is strongly negative for the first material coming off the boneblack, but increases in following portions until in the last portion it is about equal or slightly exceeds material going on. The average value of the factor for all material going on is much higher than the average coming off. Since boneblack absorbs invert from first material and gives it up to later material it is supposed that by selective action it might absorb more levulose than dextrose. This is proved by tests on invert sugar. Another cause is the molecular rearrangement of dextrose and levulose into glutose, etc. A high value of the ratio in refined products indicates inversion during refining. Losses of sucrose figured upon Clerget values exceed those figured on polarization, while losses of organic material are much less.

A report on the sugar industry of France since the war: T. H. MURPHY. The French sugar industry, born of the Napoleonic wars, almost perished in the World War, being 66 per cent. destroyed. Formerly, the 213 sugar factories supplied all French consumption and 78,739 tons per year for export. Now the 60 small factories remaining can supply only a small portion of the nation's requirements, and about 400,000 tons per year are imported. One hundred and forty-two factories were 85 per cent. destroyed, and all copper coils, bronze tubing, copper and brass screens, in fact everything made of copper, bronze or brass, and all electrical equipment, was stripped out of the war-wrecked factories and taken to Germany. The plants where sugar machinery and equipment was made, suffered the same fate. The damage to sugar factories was over $89,000,000. Reconstruction in France has made enormous strides, but on account of the highly specialized machinery and equipment required, the sugar industry, has, as yet, been able to accomplish very little. Photographs of destroyed sugar factories shown.

The composition and preparation of a sugar syrup of maximum solubility: R. F. JACKSON and C. L. GILLIS. One of the large branches of the sugar industry is the manufacture of syrups for direct consumption. If the syrup consists only of sucrose, the saturated solution may contain only 38.7 per cent. of the sugar. Such a solution is too thin for a desirable product and is susceptible to fermentation. If concentrated to a denser consistency, it becomes supersaturated and deposits sugar crystals. If, however, the sucrose is partially inverted, the density may be considerably increased, but if the inversion is carried too far, the relatively low solubility of dextrose limits the density to which the syrup may be concentrated. A study was made of the mutual solubilities of the three constituent sugars, namely, sucrose, dextrose and levulose in the presence of each other. The solubility of sucrose in varying proportions of invert sugar was determined to very high concentrations of the latter. Similarly the solubility of su-

crose in the presence of dextrose ,and of dextrose in the presence of sucrose, and finally of dextrose in the presence of levulose were measured. The results of this investigation have shown the maximum concentration which invert sugar may have without depositing crystals of dextrose, and similarly the maximum concentration which a mixture of sucrose and invert sugar may have without depositing either sucrose or dextrose. The syrup which contains 29 per cent. of sucrose and 52 per cent. of invert sugar, or a content with respect to total sugar of 81 per cent., has this maximum concentration. In general, it is practicable to increase this concentration even to a slight supersaturation without danger. Such a solution is sufficiently dense for a good syrup and resists the growth of microorganisms. A number of methods of inverting sugar have been devised. We add the suggestion that the partial inversion can be accomplished by the aid of an extremely dilute hydrochloric acid and subsequent neutralization with sodium carbonate. The net result is the addition of a minute quantity of common salt. Data are provided for controlling the method. During the investigation, the densities of invert sugar solutions, the contraction of volume accompanying inversion, and the change of viscosity were determined.

Some characteristics of imported cane sugars: C. A. Browne. The general trend in the manufacture of raw cane sugar during the past decade is shown to be towards the production of 96 test sugar, which during the past 5 years has made up about 75 per cent. of the total importations. This percentage could be increased considerably if care were taken to manufacture a drier sugar that would not deteriorate. Some of the chemical, physical, mycological and entomological characteristics of the different grades of imported raw cane sugars are discussed. During the past year, considerable plantation white sugar, testing between 98 and 100, has been imported for direct consumption. Some of this sugar is of very good quality and if care were taken always to make a clean white sugar of uniform character plantation white sugar might find a considerable demand even among the more discriminating class of users.

American progress in bacteriological sugars: Edmond H. Eitel. The history of the rare sugars virtually commences with 1883. The sugars had become essential in bacteriology when in 1914 the German supply was cut off. The U. S. government found its work critically handicapped. Appeals of a patriotic nature established a rare sugar production in America. From the laboratory stage to the commercial represents a far greater achievement than is apparent. The following sugars are now manufactured commercially: l-arabinose, dulcitol, d-galactose, d-glucose, glycogen, inositol, inulin, invert sugar, lactose, d-levulose from invert sugar, d-levulose from inulin, levulose, syrupy, maltose, d-mannitol, d-mannose, melezitose, raffinose, rhamnose, sorbitol, sucrose, trehaiose and d-kylose. A greater achievement than this list, however, is the surpassing of the old standards of Kahlbaum and the discrediting of another German superman theory. The polariscope with variable sensibility, a device of American invention, and the growing knowledge of how accurately bacteria can detect minute impurities has stimulated the new standard. The use of the rare sugars in America is being extended to physic-chemistry, chemical analysis, diet, intravenous injection, plant pathology, medicine and even to experimental explosives, as well as to advances in bacteriology. A specific example of the importance of the sugars to national health and epidemiology is the differentiation possible by their means of the paratyphoid, meat poisoning and hog cholera bacilli and the resulting possible knowledge of the source of an epidemic. The solution of the problem of the sugars calls for both the chemist and bacteriologist in combination, and in the answer light will be thrown upon morphism and bacteria, configuration of sugars, the asymmetric carbon atom, theory of life and evolution.

Results of sugar cane experiments in St. Croix: Longfield Smith.

Use of kieselguhr in the clarification of cane juice: H. S. Paine and C. F. Walton, Jr. Results are reported of a comparative study of various types of kieselguhr, or diatomaceous earth, for the purpose of correlating physical properties and clarifying efficiency as a possible means of determining relative market values. The investigation of clarifying efficiency has led to a quantitative study of the colloids removed from cane juice by different methods of clarification. These experiments included a microscopic examination of the various kieselguhrs, tests of comparative rate of filtration, sedimentation, fineness by sieving, solubility in dilute acids and alkali, and the quantitative determination by dialysis of the colloids present in the juice before and after clarifi-

cation. The results so far obtained indicate that, provided a sufficient amount of kieselguhr is used to afford the minimum adsorbing surface required for the colloids present, there is little, if any, difference in clarifying efficiency when equal weights are used, even though the various kieselguhrs may differ considerably in physical properties. The dialysis experiments further proved, as has been indicated by the work of previous investigators, that heating and filtration with kieselguhr remove all colloids of such a degree of dispersion as to give a turbidity visible to the eye. Using active decolorizing carbon after preliminary treatment of the juice with kieselguhr, it was found that colloids of such dimensions as to be invisible to the eye were thereby removed.

Determination of the density of molasses: W. B. NEWKIRK. The picnometer suggested permits a greater accuracy in the determination of the density of molasses than has been possible heretofore. It is essential for commercial reasons that an accurate method of determining the density be used. The interfering obstacles in the determination of densities of molasses are due to the high viscosity, included gases and dissolved gases. The picnometer suggested is adaptable in the presence of these difficulties. It consists of a bottle fitted with an enlargement at the top ground optically flat and closed off by another optical flat. An expansion chamber is ground on to the bottle to permit the expansion of the included gas to permit of its easy removal and is fitted with a vacuum connection and stop cock in order to put the contents of the bottle under greatly reduced pressure and maintaining the same for a considerable length of time, without the loss of moisture. The evaporation is negligible. The change in temperature of the picnometer after closing is reduced by very thick walls over the neck of the flask. This reducing temperature changes on handling. Two methods of deaerating were studied—the application of heat to reduce its viscosity and the application of air to expand the entrained gas. The heating causes considerable decomposition and has a deleterious effect in the determination of the density. The vacuum method removes entrained gas and does not have the bad features of heating or dilution. The accidental errors are shown to be very small and the total error in any one direction is shown to be within .1 of 1° Brix, and the majority of determinations can be made within a few hundredths of 1° Brix. Densities with this apparatus can be determined with reasonable facility and with considerably more accuracy than the sample of molasses can be obtained.

CHARLES L. PARSONS,
Secretary

ASSOCIATION OF AMERICAN GEOGRAPHERS

THE annual meeting of the Association of American Geographers was held with the department of geography of the University of Chicago during Convocation Week. Five sessions were held at which forty-one papers were read, nine by title.

Especial interest centered in the joint meeting with the Ecological Society of America and the session devoted to invited papers on industrial geography. The papers given at the joint meeting were as follows:

Experimental animal climatology: V. E. SHELFORD.
Geography in zoological museums: A. G. RUTHVEN.
The relation of plants to new habitats: D. T. MACDOUGALL.
Ecology and geographic boundaries: H. C. COWLES.

Owing to the necessary absence of President Gregory, because of an emergency telegram, his presidential address on "Geographic basis of the political problems of the Pacific" was omitted. The following papers on Industrial Geography were given during the afternoon session of the same day.

The significance of vegetable oils in the economic development of the tropics: V. C. FINCH.
Geographical influences in marketing; illustrated by the meat industry: GUY C. SMITH.
Geographic factors in dairy farming in southern New England: RICHARD E. DODGE.

The papers presented at the remaining sessions were as follows:

Rainfall maps of Latin America: EUGENE VAN CLEEF.
The trade winds and anti-trades of Porto Rico: OLIVER L. FASSIG.
Progress in organization of the Climatological Service of the West Indies: OLIVER L. FASSIG.
Rise in temperature on mountain summits earlier than on valley floors: H. J. COX.
Cold surf with off shore winds: CHARLES F. BROOKS.
Vertical gradients of evaporation and soil moisture in desert and coastal mountains: FORREST SHREVE.
Stream and ocean terraces in relation to recent earth movements: R. S. HOLWAY.

The status of the general magnetic survey of the earth: L. A. Bauer.

A significant contrast between the Atlantic and Pacific regions: W. H. Hobbs.

Intermont basins: W. M. Davis. (By title.)

The importance and permanence of the physical factors in determining the utilization of land for agricultural and forest production: O. E. Baker.

Problems of land classification: Carl O. Sauer.

Distribution of sunlight and moonlight over the earth: Zonia Baber.

Chili: a land where immigrants need not apply: Mark Jefferson.

Some aspects of the geography of South Dakota: S. S. Visher. (By title.)

Finland as an independent republic: J. J. Sederholm. (By title.)

The Armenian frontier: Lawrence Martin. (By title.)

The geography of part of southeastern Idaho: G. R. Mansfield. (By title.)

Geographical regions of the fisheries of Asiatic Russia: S. J. Novakovsky.

The grain trade of ancient Athens: Ellen Churchill Semple.

Geography and man in Cuba: R. H. Whitbeck.

Geography and man at Panama: R. H. Whitbeck. (By title.)

Physiography and man in Porto Rica: A. K. Lobeck.

Notes on the geography of Honduras: N. A. Bengston.

A geographic study of the Saginaw Valley as an area of gentle relief: F. W. Frostic. (By title.)

Population changes in Nebraska since 1880: Esther S. Anderson.

Nashville and the central basin of Tennessee: K. C. McMurry.

The world's markets: a map based on natural regions: Eugene Van Cleef.

Significant geographic problems of the outwash plains of southern Michigan: D. H. Davis.

Census maps of the United States with some suggestions for improvement from the standpoint of geography: R. M. Brown. (By title.)

Development of productive scholarship among American geographers: W. W. Atwood. (By title.)

Bering's two expeditions to determine the relation of America to Asia: W. L. G. Joerg.

Geography as regional economics: Carl O. Sauer.

The enjoyable and stimulating sessions were supplemented by an evening dinner tendered to the association by the Geographic Society of Chicago and by an informal lunch given by the department of geography of the University of Chicago. Both these events gave an opportunity for social greeting and discussion that was much appreciated, for in the rush and demands of so large a meeting, and group of meetings, there is but little chance for social get-togethers unless they are deliberately planned for.

During the sessions the Council met and acted upon a number of important plans. W. M. Davis was appointed representative of the association in the Division of Geology and Geography of the National Research Council. He succeeds himself for a period of three years.

It was voted to hold the next annual meeting in the city of Washington during Christmas week, 1921; and to recommend to the Council of 1921 that the meeting for 1922 be held in the east and that for 1923 in the mid-west.

A canvass of the ballots showed the following officers elected for the year: *President,* Ellen Churchill Semple; *Vice-presidents,* A. J. Henry and Curtis F. Marbut; *Secretary,* Richard E. Dodge; *Treasurer,* George B. Roorbach; *Councillors,* Eliot Blackwelder, Ray H. Whitbeck, Nevin M. Fenneman.

The spring joint meeting with the American Geographical Society will be held at the society's building in New York City on April 22 and 23, 1921. Program will be published as soon as completed so that all who are interested in the papers to be given may attend. The secretary will be glad to receive the names of those who would like to be informed of meetings of the association so that they may receive programs of papers as issued.

Richard Elwood Dodge,
Secretary

Storrs, Conn.

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